

## Harmonic Hangers

### Georgia Standards of Excellence:

#### **S1P1. Obtain, evaluate, and communicate information to investigate light and sound.**

d. Construct an explanation supported by evidence that vibrating materials can make sound and that sound can make materials vibrate.

e. Design a signal that can serve as an emergency alert using light and/or sound to communicate over a distance.

**S4P2.** Obtain, evaluate, and communicate information about how sound is produced and changed and how sound and/or light can be used to communicate.

- a. Plan and carry out an investigation utilizing everyday objects to produce sound and predict the effects of changing the strength or speed of vibrations.

**S8P4.** Obtain, evaluate, and communicate information to support the claim that electromagnetic (light) waves behave differently than mechanical (sound) waves.

e. Analyze and interpret data to predict patterns in the relationship between density of media and wave behavior.

**Objective:** Students will construct a suspension system to hold a hanger and listen to the sound produced when it is briskly struck with a pencil or other similar object. The students will listen to the sound produced by different diameter hangers and draw conclusions about the sound of the hanger and the sound that is produced.

### Materials:

- Two paper cups or plastic cups, (optional)
- paper clips to hold the cups in place (optional)
- two 50 cm pieces of string
- various sized wire coat hangers

### Discussion:

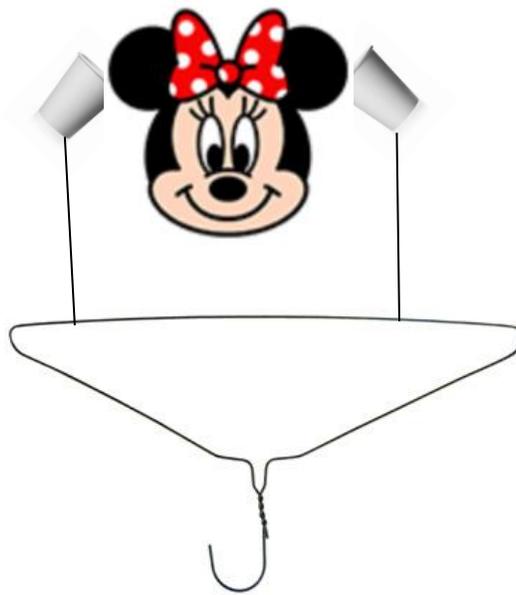
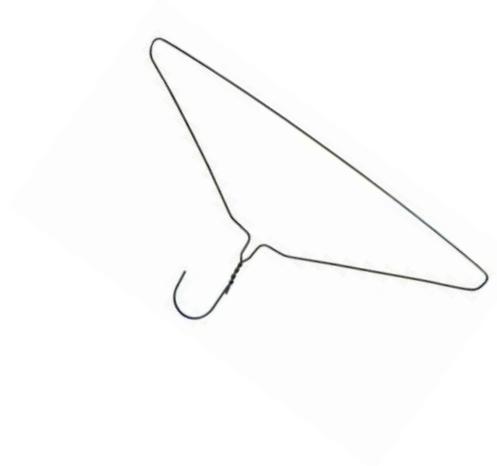
As an object, such as a piano string or coat hanger, vibrates and in the air and sets the air around it into motion. The vibration produces air which is alternately packed together (compressed) and spread apart (rarefies). These compression/rarefaction waves then move out from the source in three dimensions at the local speed of sound. The density of the medium in which the waves moves, causes the waves to move at different



speeds. Thicker or more dense the medium, faster the sound waves will travel. So, sound travels much faster in water than it does in air because water is denser than air.

**Procedure:**

1. Punch a small hole in the bottom center of two cups.
2. Fasten the string to the cups with the paper clip.
3. Tie the other end of the each of the two strings to coat hanger.
4. Hold the cups to your ears while you strike the hanger.
5. Compare the tone you hear using different sized hangers.



**Things to Consider:**

What if you changed the string that you used to hang the coat hanger?

What if you used a plastic coat hanger instead, what would you hear?

What else could you hang at the end of the string instead of a coat hanger?